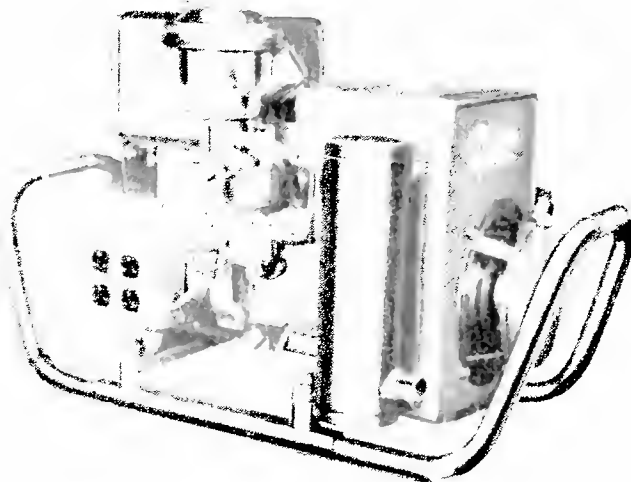


OPERATOR'S MANUAL

FOR

AJ
SERIES

ELECTRIC GENERATING SETS



FORM NUMBER
924-0121

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SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING Onan uses this symbol throughout this manual to warn of possible serious personal injury.

CAUTION This symbol refers to possible equipment damage.

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures

- **Use Extreme Caution Near Gasoline. Gaseous Fuel And Diesel Fuel. A constant potential explosive or fire hazard exists.**

Do not fill fuel tank near unit with engine running. Do not smoke or use open flame near the unit or the fuel tank.

Be sure all fuel supplies have a positive shutoff valve

Fuel lines must be of steel piping, adequately secured and free from leaks. Do not use copper piping on flexible lines as copper becomes hardened and brittle. Use black pipe on natural gas or gaseous fuels, not on gasoline or diesel fuels. Piping at the engine should be approved flexible line.

Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.

- **Guard Against Electric Shock**

Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.

Always use an appropriately sized, approved double-throw transfer switch with any standby generator set. **DO NOT PLUG PORTABLE OR STANDBY SETS DIRECTLY INTO A HOUSE RECEPTACLE TO PROVIDE EMERGENCY POWER.** It is possible for current to flow from generator into the utility line. This creates extreme hazards to anyone working on lines to restore power.

Use extreme caution when working on electrical components. High voltages cause injury or death.

Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

- **Do Not Smoke While Servicing Batteries**

Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

- **Exhaust Gases Are Toxic**

Provide an adequate exhaust system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

Be sure the unit is well ventilated.

- **Keep The Unit And Surrounding Area Clean.**

Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

Dispose of oily rags. Keep the floor clean and dry.

- **Protect Against Moving Parts.**

Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted because of the danger of becoming caught in moving parts.

Make sure all nuts and bolts are secure. Keep power shields and guards in position.

If adjustments *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

Do not work on this equipment when mentally or physically fatigued.

TO THE OWNER

Welcome to the growing family of *Onan Power users* . . . We are proud to have you as a customer.

Read this manual carefully and observe all safety rules within. Operating instructions, adjustments and periodic maintenance procedures are given so that you . . . the owner, can keep your unit running like new and expect many years of dependable service from it. Remember . . . any machine, regardless of design or type, will perform only in relation to the services it receives.

If your generator set needs special attention, ask your Onan dealer for assistance; the Onan Parts and Service Organization has been factory-trained to provide up-to-date know-how for keeping your electric generating set "on the job". A complete Parts Catalog is available at nominal cost and may be ordered under #924-0221.

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WARNING

TO PREVENT FIRE OR ACCIDENT HAZARD . . .
THIS UNIT MUST BE INSTALLED ACCORDING
TO THE MANUFACTURER'S DETAILED IN-
STALLATION PROCEDURES OBSERVING ALL
MINIMUM CLEARANCES.

TO AVOID POSSIBLE PERSONAL INJURY OR
EQUIPMENT DAMAGE, ANY INSTALLATION
AND ALL SERVICE MUST BE PERFORMED BY
QUALIFIED PERSONNEL.

GENERAL INFORMATION

YOUR MANUAL

This manual contains operation and other information to properly maintain, service, and make adjustments on your AJ generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important part of repair is diagnosis, a troubleshooting chart is included.

Throughout the manual, engine end of the generator set is the front. Left and right sides are determined when facing the engine (front) end.

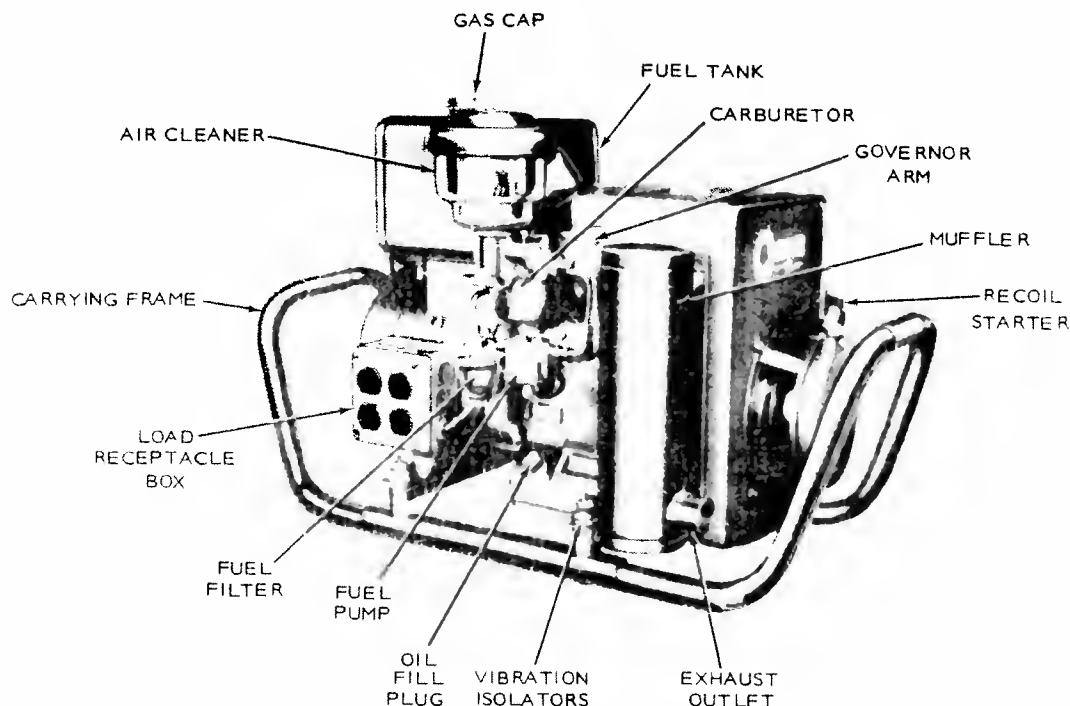
When contacting your Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate (see *Model Designation* following). This information is necessary to identify your generator set among the many types manufactured by Onan.

MODEL DESIGNATION

The following typical model number is broken down into code segments used by Onan.

2.5	AJ	-	1	E	/	135	N
1	2		3	4		5	6

1. Indicates kilowatt rating.
2. Series identification.
3. Voltage code of the generator, 1 = 120 volts.
4. Method of starting:
M - MANUAL. Pull rope starting. For permanent or portable installations.
P - PORTABLE. Pull rope starting. Mounted in carrying frame for portable use.
E - ELECTRIC. Electric starting at the set only.
5. Factory code for designating optional equipment, if any.
6. Specification letter which advances when the factory makes production modifications.



TYPICAL AJ GENERATOR SET.

SPECIFICATIONS

ENGINE

Manufacturer	ONAN
Design	Four-Cycle, L Head, Air Cooled
Cylinders	One
Bore	2-3/4 inch (69.85 mm)
Stroke	2-1/2 inch (63.50 mm)
Displacement	14.9 cu. in. (268.63 cc)
Compression Ratio	
Gasoline	6.25:1*
Gas	7:1
Battery Voltage (No Battery used on Portable Models)	12 Volts
Battery Size	
SAE group 1H	Two 6-Volt in series
Amp/hr. rating, SAE	105 (378 kC)
Starting System	Generator Cranking

GENERATOR

Manufacturer	ONAN
Design	
1.0AJ (60 Hertz)	Four Pole, 1800 rpm
2.5AJ (60 Hertz)	Two Pole, 3600 rpm
Rating	
1.0AJ	1000 Watts (1 kW)
2.5AJ	2500 Watts (2.5 kW)
Voltage	120 or 120/240
Current Rating	
120 Volt (2.5AJ)	20.8 Amperes
240 Volt (2.5AJ)	10.4 Amperes
Phase	Single
Wire	Two
Output Rating	1.0 PF

CAPACITIES AND REQUIREMENTS

Oil Capacity	3.5 pints (1.65 litres)
	Portable Models 2.5 pints (1.18 litres)
Total Ventilation Required (cfm @ 1800 rpm)	
Pressure cooled	115 (3.26 m ³ /min)
Vacu-Flo cooled	180 (5.10 m ³ /min)
Total Ventilation Required (cfm @ 3600 rpm)	
Pressure cooled	224 (6.34 m ³ /min)
Vacu-Flo cooled	370 (10.48 m ³ /min)

TUNE-UP SPECIFICATIONS

Spark Plug Gap	
Gasoline025 inch (0.64 mm)
Gas018 inch (0.46 mm)
Breaker Point Gap020 to .022 inch (0.51 - 0.56 mm)
Ignition Timing	
3000 RPM and 3600 RPM	25° BTC
1800 RPM	19° BTC
Tappet Adjustment (Engine Cold)	
Intake and Exhaust010 to .012 inch (0.25 mm to 0.30 mm)
Carburetor Float Adjustment	11/64 inch (4.37 mm)
Cylinder Head Torque	24 to 26 ft. lb. (32.54 to 35.26 N•m)

* - Nonleaded or low lead regular grade gasoline recommended.
NOTE: Hertz is a unit of frequency equal to one cycle per second.

INSTALLATION

COOLING AIR

Pressure cooled sets require an air inlet opening of one square foot and an air outlet of two square feet. Position the outlet opening above and to the rear of the set, the inlet opening just opposite the blower housing.

VACU-FLO COOLED

Air flow through Vacu-Flo units is reversed. Provide an air inlet of at least 41 square inches for 3000 or 3600 rpm units. Duct the heated air outside. An optional automatic air shutter and air duct is available for use in cold weather.

EXHAUST

WARNING

Pipe **POISONOUS** exhaust gas outside — exhaust gas is deadly!

Use flexible tubing between the set exhaust outlet and rigid piping. Shield the line if it passes through a combustible wall or partition. If turns are necessary, use long sweeping type elbows. Use one pipe size larger for each ten feet in length. Position the exhaust outlet away from the set air intake.

WARNING

Do not use exhaust heat for heating purposes. Possible leakage of exhaust gases could occur.

LOCATION

Provide a protected location that is dry, dust-free, and preferably heated in cold weather. For service convenience, provide at least 24 inch clearance around set.

OIL DRAIN

For convenience in draining oil, remove the oil drain plug and install an extension pipe and coupling.

FUEL CONNECTION

For gasoline sets, connect the fuel line to the fuel pump inlet. Pump is threaded 1/8-27 NPTF (American Standard Internal Tapered Pipe Thread).

Connect the set to the fuel source with a flexible line to avoid line failure due to vibration.

For gaseous sets (see Figure 2), check with the local fuel supplier for gas regulations and line pressure. Provide a manual gas shutoff valve. A filter in the line may be necessary. Electric solenoid shutoff valves in the supply line are usually required for indoor automatic or remote starting installations (see Figure 2). A special wiring diagram is supplied with 2000 or 2500 watt sets. Manual start sets cannot use a solenoid valve. Be sure fuel line pressure is within the 3 to 8 ounce limits of the regulator.

Always use flexible tubing between engine and gas demand regulator.

Gas-Gasoline sets provide a manual shutoff valve in both fuel supply lines.

GASOLINE TANK

If a separate fuel tank is used, install the tank so the bottom is less than four feet below the fuel pump. The tank top must be below fuel pump level to prevent siphoning. Install a shut-off valve at the tank. When the fuel tank is shared with another engine, use a separate fuel line for each to avoid starving the set.

If fuel lift *must exceed four feet*, install an auxiliary electric fuel pump at the fuel supply. If an auxiliary reservoir fuel tank is used for a *standby* installation, note that fuel line connections must be changed (Figure 3).

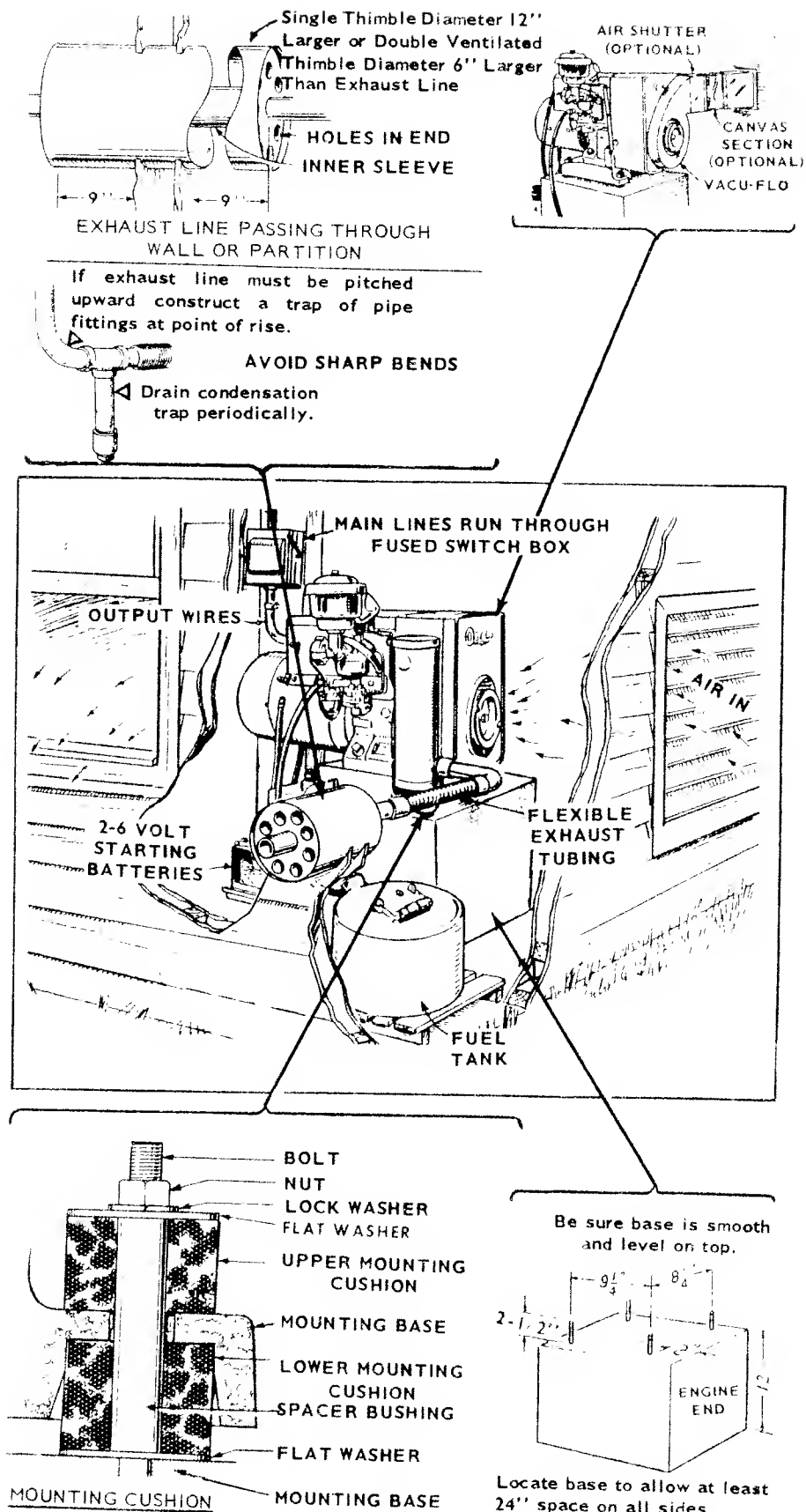


FIGURE 1. TYPICAL INSTALLATION

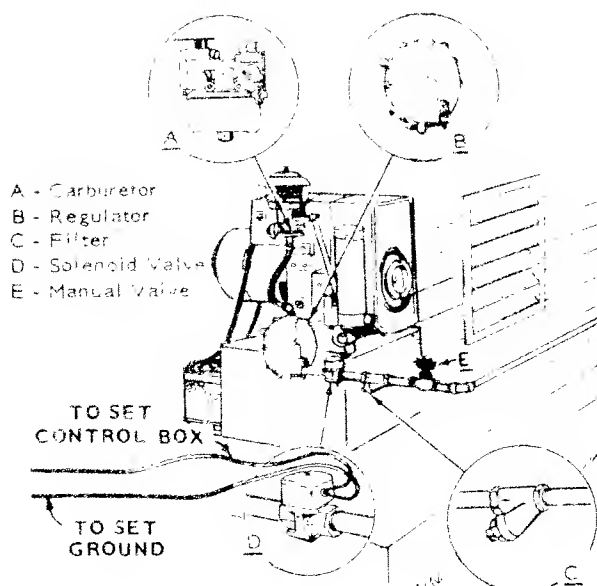


FIGURE 2. GAS INSTALLATION

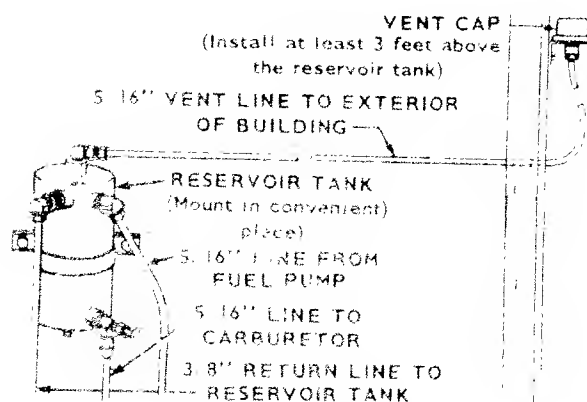


FIGURE 3. AUXILIARY FUEL TANK

BATTERY

Connect battery as shown in Figure 4 according to the set specification letter.

CAUTION Never operate an electric start (at set only) battery charging set with the battery disconnected or charge damage may occur.

On Fire Department Models, a 12 volt polarized plug is furnished with the unit. Connect plug to cables shown below (according to distance), and use with vehicle battery. This generator set can be used with the vehicle battery regardless of positive (+) or negative (-) ground.

CAUTION Battery connections must be made with a negative ground. An incorrect connection (positive ground) will cause instant damage to the diode in the battery charge circuit.

To start, plug into receptacle on control, and push start switch. With the set running, batteries can be left connected or they can be disconnected without damaging the circuit.

RECOMMENDED WIRE SIZE (TO BATTERY) ON FIRE DEPARTMENT MODELS

If one-way distance is:

Under 3 feet (0.91 m) Use #6 wire
4 to 5 feet (1.22 m to 1.52 m) Use #4 wire
6 to 8 feet (1.83 m to 2.44 m) Use #2 wire
9 to 12 feet (2.74 m to 3.66 m) Use #1/0 wire
13 to 19 feet (3.96 m to 5.79 m) Use #4/0 wire

LOAD CONNECTIONS

For units with output receptacles, plug directly into the receptacles. Loose leads are provided on REMOTE sets. Connect the flexible wire (enclosed in Greenfield shielding or as required by local regulations) between the set and nearest support point. Full output of 120 volts is available from M1-M2 generator leads. The generator output lead connections for output voltages are indicated on the unit.

For 2 wire models, connect the load neutral wire (white color code) to the generator M2 lead. Connect the "hot" load wire (black color code) to the generator M1 lead. For 3 wire models, use leads M1-M2 for 120 volt output. Use leads M1-M3 for 240 volt output. Leads M1-M2-M3 are for 120, 240 volt output.

WARNING If the installation is for standby service, a double throw transfer switch must always be used. Connect this switch (either automatic or manual) so that it is impossible for commercial power and generator current to be connected to the load at the same time. Instructions for connecting an automatic load transfer control are included with such equipment.

WARNING Personnel connecting the generator and any such auxiliary equipment must be fully qualified and understand wiring diagrams, circuits, etc.

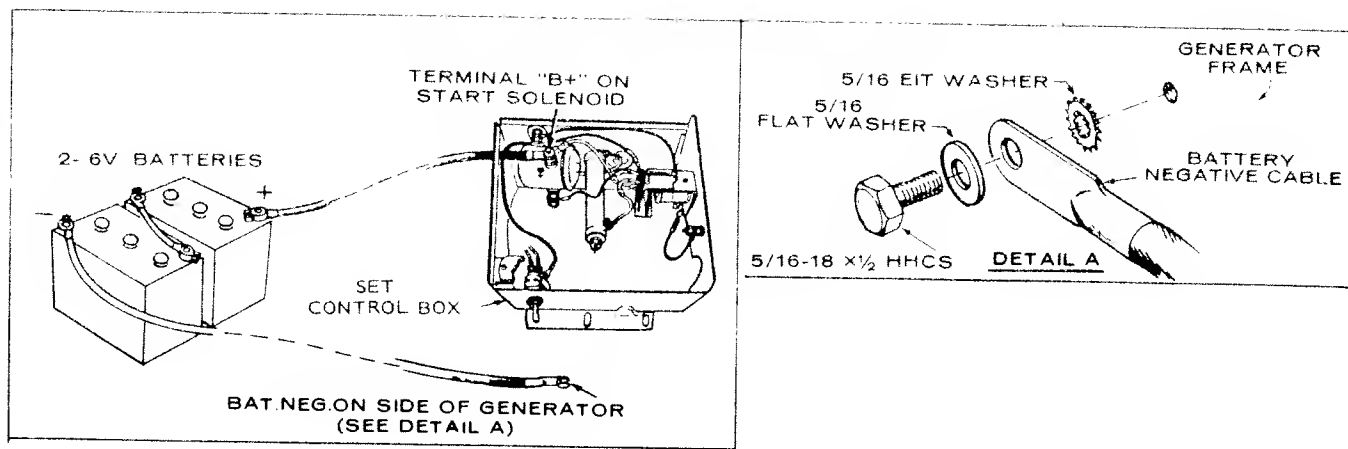
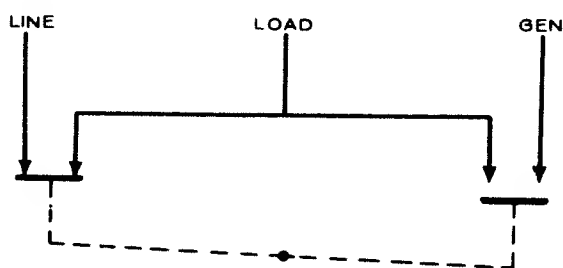


FIGURE 4. BATTERY CONNECTIONS



NOTE: SHOWN WITH LINE CONNECTED TO LOAD

FIGURE 5. DOUBLE THROW TRANSFER SWITCH

WARNING

ENGINE EXHAUST GAS (CARBON MONOXIDE) IS DEADLY!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- Dizziness
- Intense Headache
- Weakness and Sleepiness
- Vomiting
- Muscular Twitching
- Throbbing in Temples

If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

REMOTE START-STOP SWITCH (Optional)

For remote control of starting and stopping, use three wires to connect a remote switch (SPDT, momentary contact, center-off type) to the terminal block marked B+, 1, 2, 3 in the set control box (Figure 6). Use correct wire size according to switch distance from set.

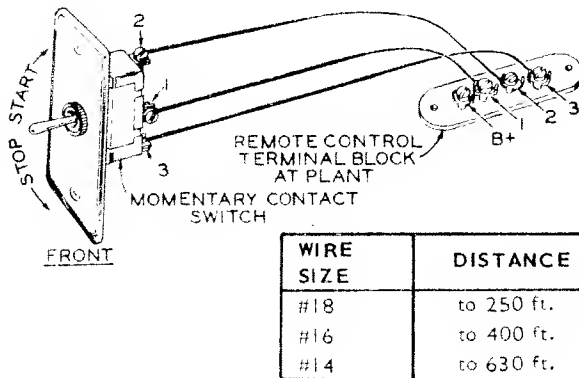


FIGURE 6. REMOTE CONTROL WIRING

GROUNDING, AC GENERATOR SET

A terminal is provided for connecting a ground wire. For permanent installations, connect to a separate ground pipe or rod penetrating into moist earth.

UTILITY TRUCK MODEL

This model supplies 12 volt DC and 120 volt AC power.

1. **Battery Connection:** Use #2 cables for distances up to 8 feet, larger cables for longer distances. There must be at least 9 volts at the set during cranking. If the truck uses a positive ground system, reverse the cable connections to the unit. The set ammeter will read in reverse. Either reverse the wire connections at the ammeter, or mark the panel to indicate the reversed charge direction of the meter needle. Connect #18 or larger wire from the truck *arm* terminal to the unused C terminal on the set charge-disconnect-relay (on units Spec A through F, connect to the B on the terminal block). This connection is not used when truck battery is alternator charged (see wiring diagram).
2. **Remote Start-Stop Switch:** For starting and stopping from truck cab or other point, install a switch as described for a standard unit (see Figure 6).
3. **AC Load Wiring:** Mount receptacles on the truck and run permanent wiring to the set output leads M1 (hot) and M2 (grounded). If grounded receptacles are used, connect the ground wire to the set ground terminal.

GAS FUEL

Connect the electric fuel solenoid shut-off valve so it is open when the unit is running. See Figure 7 and wiring diagram.

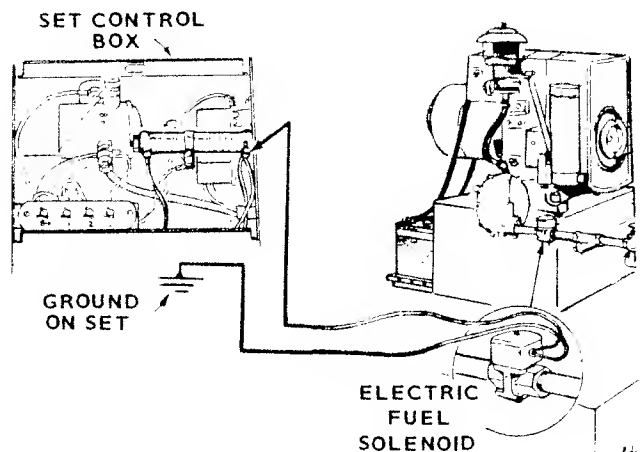


FIGURE 7. FUEL SOLENOID SHUTOFF VALVE

OPERATION

GENERAL

Rust inhibitor oil used at the factory may foul the spark plug. Clean plug in a suitable solvent, dry and install. After priming a "dry" fuel system, leave the fuel pump hand lever in its down position (see Figure 8).

MANUAL STARTING (PORTABLE UNIT)

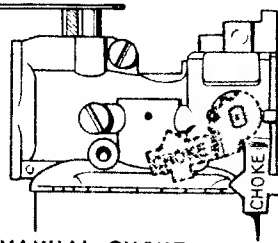
1. Adjust carburetor choke according to starting temperature conditions.
2. Pull starting rope slowly until piston passes over compression.
3. Rewind the rope to starting position.
4. Pull rope with a fast, steady pull to crank engine. Do not jerk.
5. As the set warms up, slowly adjust choke to its full open position.

ELECTRIC-STARTING REMOTE-CONTROL AC SET

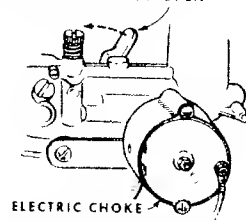
1. Push *start-stop* switch to *start* position.
2. Release the switch when unit starts.
3. If the set is gas fueled (with solenoid valve in fuel supply line) and has a *hi-lo* battery charge toggle switch, position switch at its *hi* position for each start. The switch can be returned to *lo* for normal operation.

BATTERY CHARGING UNIT

1. Adjust carburetor manual choke according to starting temperature conditions.
2. Push *start* switch to crank the engine.
3. Release *start* switch when the set starts.
4. As the set warms up, slowly adjust choke to full open position.



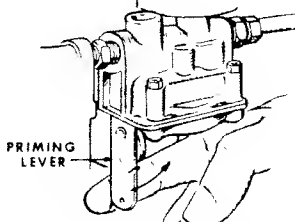
MANUAL CHOKE




TURN WEIGHT LEVER IN THIS DIRECTION TO OPEN

ELECTRIC CHOKE

AUTO. CHOKE



FUEL PUMP PRIMER



WIND STARTING ROPE ON SHEAVE IN CLOCKWISE DIRECTION

START ROPE

Use Only Regular or Unleaded Fuel. Do Not Fill Tank With Engine Running. Leave Fuel Expansion Room in Tank.

After Priming Fuel System, Return Fuel Pump Primer Lever to Downward Position.

SET TYPE	STARTING		SET RUNNING	
	1	2	3	4
Manual	Adjust Choke	Pull Start Rope	-----	Adjust Choke
Remote	-----	Push START Switch	Release START Switch	HI Rate * Battery Charge
▲ Battery Charger	Adjust Choke	Push START Switch	Release START Switch	Adjust Choke

▲ DO NOT START OR RUN SET WITHOUT BATTERY CONNECTED INTO LOAD CIRCUIT.

* Gaseous fueled sets with electric solenoid valve in fuel supply line only. Switch may be returned to LO rate for normal operation.

FIGURE 8. STARTING PROCEDURE

Never start or run battery charging sets unless the battery is connected. Be sure the set battery switch is closed and fuses are good.

GASOLINE FUEL

Capacity of the mounted tank (manual starting models) is two U.S. gallons. Some models are supplied with a separate 5 gallon tank.

Use "regular" grade automobile gasoline. DO NOT use highly leaded "premium" types. For new engines, most satisfactory results will be obtained by using nonleaded gasoline. For older engines that have previously used leaded gasoline, heads must be taken off and all lead deposits removed from engine before switching to nonleaded gasoline.

CAUTION If lead deposits are not removed from engine before switching from leaded to nonleaded gasoline, preignition could occur causing severe damage to the engine.

WARNING Never fill the fuel tank when the engine is running. Leave some tank space for fuel expansion to prevent the possibility of explosion.

STOPPING

Press *stop* switch on the blower housing of manual starting models (on control box of other models) until the unit comes to a complete stop. If the switch is released too soon, the unit will continue to run.

LOAD OPERATION

Warm up the set before connecting a heavy electrical load. Continuous overloading of the generator may cause overheating and serious damage to the windings. The generator safely handles overloads temporarily, but for normal operation, keep the load within nameplate rating.

BREAK-IN PROCEDURE

Controlled break-in with the proper oil and a conscientiously applied maintenance program will help to assure satisfactory service from your Onan electric set.

When operating engine for the first time, use the following sequence:

1. One half hour at 1/2 load.
2. One half hour at 3/4 load.
3. Full load.

ALTERNATING CURRENT UNITS

Connect the load to manual start sets by inserting load plugs into the output receptacles. Remote control units are normally installed with a line switch which must be closed to connect the load.

Battery Charge Rate, AC Models: Some sets have a charge rate ammeter and *hi-lo* toggle switch. Use the

lo position (approximately 1-1/2 amps) for normal operation. Use the *hi* position if frequent starts and short operating periods cause the battery charge condition to decline.

Idle-matic Model: The automatic idle device slows engine speed from its normal 3600 rpm to 1800 rpm when load is removed. Application of a 100 watt load or more, will cause the engine to resume its normal speed. Do not leave a load of less than 100 watts connected, as voltage and frequency drop to about 1/2 their rated values during idle operation.

A toggle switch on the outlet box controls idle operation. For automatic idle, set the switch to its *on* position. For continuous high speed operation (no idle when load is disconnected) set the switch to its *off* position.

BATTERY CHARGING UNIT

The battery charge rate depends on engine speed. Regulate by turning the governor adjusting nut (see ADJUSTMENT section). Follow recommendations of battery manufacturer for rate of charge, when to charge, etc. *Never operate set without battery connected to set.*

INFREQUENT SERVICE

If the set is used infrequently (as in standby service for commercial power) extended shutdown periods can result in difficult starting. Run the set at least 30 minutes every week to eliminate hard starting.

EXTENDED OUT-OF-SERVICE PROTECTION — GASOLINE ENGINES

Generator sets removed from service for extended periods of time (over 30 days) should be protected from rust and corrosion. Onan recommends the following protective procedure:

1. Run set until thoroughly warm with generator under at least 50% load. Stop engine by shutting off fuel supply to allow engine to drain fuel lines and carburetor.
2. Drain oil base while still warm. Refill and attach a tag indicating viscosity of oil used.
3. Remove spark plug. Pour 1-ounce of rust inhibiting oil into cylinder. Crank engine over several times. Install spark plug.
4. Service air cleaner
5. Clean throttle and governor linkage; protect by wrapping with a clean cloth.
6. Plug exhaust outlet to prevent entrance of moisture, bugs, dirt, etc.
7. Clean off dirt and dry entire unit. Coat parts likely to rust with a light film of oil or grease.
8. Disconnect battery and follow standard battery storage procedure. Apply a film of non-

conductive grease (e.g. vaseline) to battery cable terminal lugs.

9. Provide a suitable protective cover for the entire unit.

RETURNING UNIT TO SERVICE

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Measure specific gravity (1.260 at 25°C [77°F]) and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity is correct. **DO NOT OVERCHARGE.**

WARNING Do not smoke while servicing batteries. Explosive gases are emitted from batteries in operation. Ignition of these gases can cause severe personal injury.

4. Connect batteries.
5. Verify that no loads are connected to the generator.
6. Start engine.

After engine has started, excessive blue smoke will be exhausted and the engine will run rough until the rust inhibitor or oil has burned away.

7. After start, apply load to at least 50% of rated capacity.

HIGH TEMPERATURES

See that nothing obstructs air flow to and from the unit. Keep the cooling fins clean. See that air housings are properly installed and undamaged. Keep ignition timing properly adjusted.

LOW TEMPERATURES

1. Use the proper SAE No. oil for the temperature conditions. Change oil only when engine is hot. If an unexpected temperature drop causes an emergency, move the unit to a warm location or apply heated air (do not use open flame) externally until oil flows freely.
2. Use fresh, (not *premium* type) gasoline. Protect against moisture condensation. Below 0°F, open the carburetor main jet one additional turn. Keep the spark plug and magneto breaker points clean and properly adjusted. Keep batteries in a well charged condition.

DUSTY OR DIRTY CONDITIONS

1. Keep the set clean. Do not allow cooling fins to become coated or obstructed with debris.
2. Service the air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours.

HIGH ALTITUDE

For altitudes of 1500 feet or more above sea level, close the carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio. Refer to the ADJUSTMENTS section. Maximum power drops approximately 4% for each 1000 feet after the first 1000 feet above sea level.

FIRE DEPARTMENT MODELS

These electric start models can be operated with batteries connected or disconnected.

GAS-GASOLINE CONVERSION

Engines having a combination gas-gasoline carburetor can be switched to gasoline operation by the following procedure:

1. Close the manual fuel shutoff valve in supply line (the main fuel adjustment valve in the carburetor is not designed to use as a shutoff valve) for gaseous fuel (set will not operate smoothly with both fuel supply lines turned on at the same time)
2. Open the gasoline fuel shutoff valve.
3. Set the spark plug gap as given in the SPECIFICATIONS section.
4. See that the choke is free and works easily (be sure to release choke lock on sets with electric choke).
5. Start the engine in the usual manner. If the engine runs unevenly under half or full load, due to faulty carburetor adjustment, the main jet needs adjusting.

To change back to gaseous fuel, reverse the above procedure and reset the spark plug gap as given in the SPECIFICATIONS section. Use all gasoline from the carburetor to avoid stale fuel. If engine is run with one of the fuel supply lines disconnected, plug other outlet to prevent drawing air and dirt.

ADJUSTMENTS

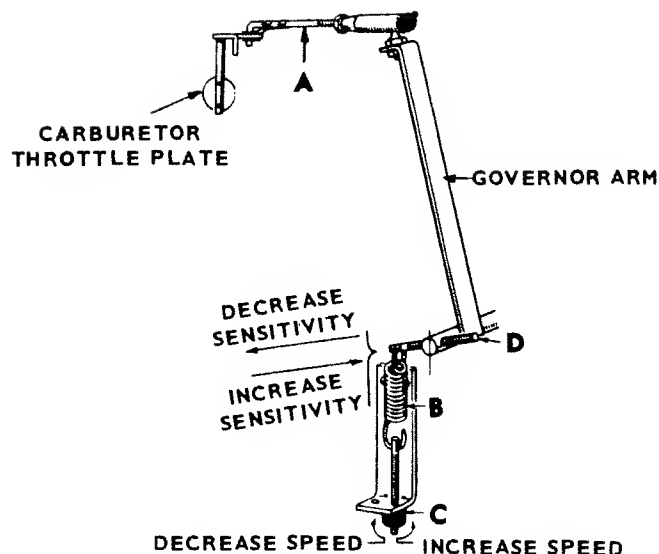


FIGURE 9. GOVERNOR ADJUSTMENT

GOVERNOR

The governor controls engine speed and engine speed determines the voltage and frequency of the generator current. On battery charging units, engine speed also determines battery charge rate. Binding at any point of the governor, linkage, or carburetor throttle, causes slow governor action. Loose or worn parts cause erratic governor action.

With the set stopped, the length of linkage "A" must (with tension on spring "B") allow the carburetor throttle stop lever to just clear (maximum 1/32 inch) the carburetor body (Figure 9). Alter linkage length by turning the ball joint on the threaded rod. Run the set (under load) to thoroughly warm it up.

1. **Alternating Current Set:** Connect a voltmeter across the generator output. With the set operating at no-load, adjust the speed nut "C" (Figure 9) for a voltmeter reading of 126 volts for 120 volt sets (252 volts for 240 volt sets). Voltage should not fall below 108 volts for a 120 volt set (216 volts for a 240 volt set) under full rated load.

If voltage drop from no-load is too great, turn sensitivity screw "D" clockwise. If voltage drop is within the above limits, but is unsteady with a tendency to alternately increase and decrease, turn the sensitivity screw counterclockwise. Any change in the sensitivity screw "D" setting requires a compensating change in the speed adjustment nut "C".

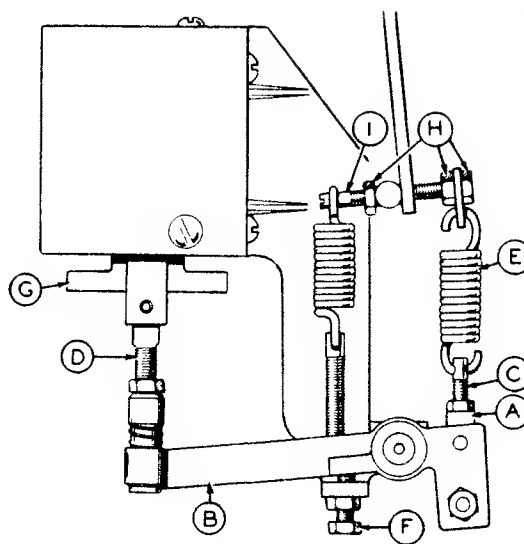


FIGURE 10. AUTOMATIC IDLE ADJUSTMENT

2. **Automatic Idle Set:** The special idle device drops engine speed to approximately 1800 rpm when the set is operating at no-load (without an electrical load connected). The idle device automatically restores operating speed when an electrical load (100 watts or more for 120 volt models) is connected.

Set the idle control switch at the *off* position, and no tension on its spring "E", Figure 10. Be sure the carburetor is properly adjusted. Temporarily disconnect flexible joint "A" from lever "B". Its socket slips off the ball. Adjust the governor for normal 3600 rpm operation under no-load to full-load conditions, with nuts "H" loosened. Tighten lock nuts "H", with spring "E" as close to the end of the sensitivity screw as possible. Reconnect joint "A" to lever "B". Turn stop adjusting screw "F" down for maximum lever movement.

Set the idle control switch to *on* position. With all electrical load removed, the solenoid should pull up and provide sufficient tension on spring "E" to over-ride the tension of the regulating governor spring and reduce engine speed to about 1800 rpm. Output at 1800 rpm should be about 55 volts. If idle speed and output voltage are too high, linkage "C" or "D" is too long. If idle speed and output voltage are too low, linkage "C" or "D" is short. With a full electrical load connected, the solenoid plunger should drop downward. Adjust screw "F" so spring "E" is firm but not stretched. Tighten all lock nuts.

CAUTION Never operate set with solenoid plunger "G" removed (unless control toggle switch is OFF).

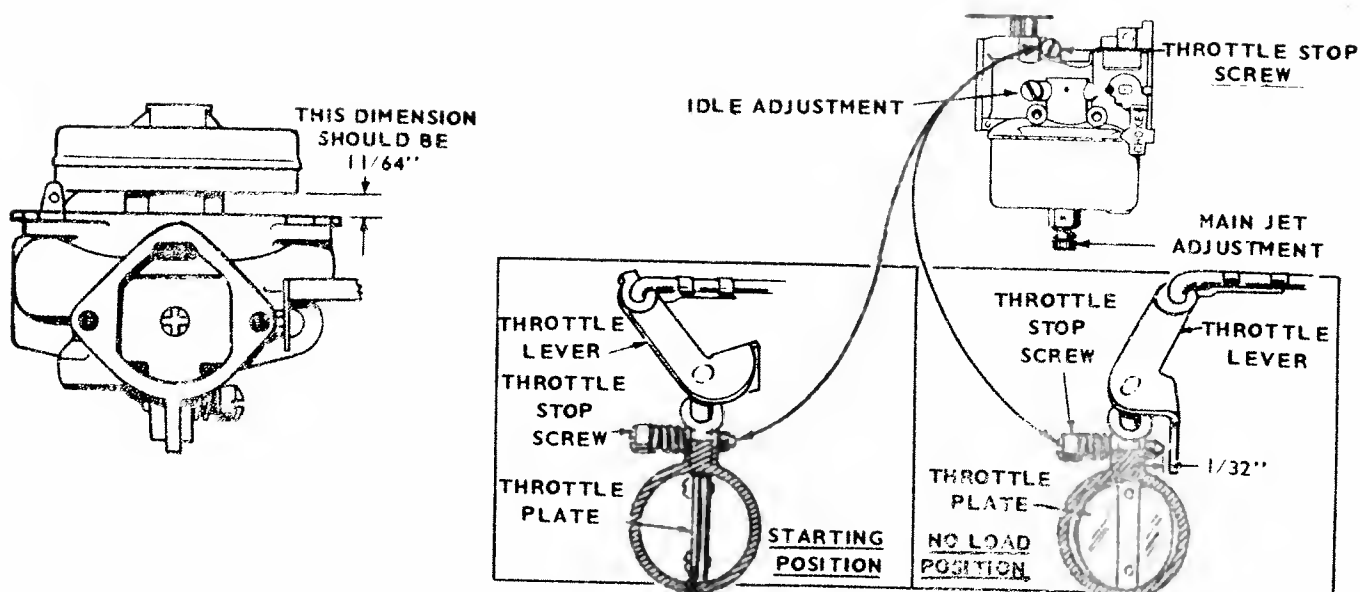


FIGURE 11. CARBURETOR ADJUSTMENT

3. **Battery Charging Set:** Turn speed nut "C" (Figure 9) to give the desired charge rate. Normal speed, as specified on the nameplate, is approximately 2400 rpm. If the charge rate tends to "taper off" too soon, turn the sensitivity screw "D" clockwise. If the charge rate is unsteady, turn the sensitivity screw "D" counterclockwise.
4. **"Utility Truck" Set:** Adjust the governor for proper sensitivity as instructed for a standard AC unit. With the set stopped, disconnect generator lead A1 from the "Gen" terminal of the reverse current relay (inside control box). Connect a DC voltmeter between lead A1 and ground. Start the set and (no AC load connected) adjust the speed nut to deliver 15 volts DC. Remove voltmeter and connect A1 lead to the relay.

CARBURETOR ADJUSTMENT

If the carburetor is completely out of adjustment, turn the idle adjustment (Figure 11) and main adjustment needle "B" in gently until the set starts. Do not use force — tight seating causes damage. Once A Through J, the main adjustment needle was located on the top of carburetor. Back off idle needle "A" one turn and main needle "B" 2-1/2 turns to permit starting the set.

Start the set and allow it to warm up. With full rated load connected, turn main needle "B" in slowly until the set begins to lose speed (or voltage drops). Then turn the needle back out to the point where the set will carry the full load. Check operation under various loads. If there is any tendency to hunt, turn the needle "B" (out) to the point where operation is steady. Do not turn out more than 1/2 turn past the point of smooth full-load operation. Continuous unstable operation may be due to improper governor adjustment. Adjust idle needle "A" with no AC load connected (or at the lowest possible charge rate if unit is a

battery charging set). Turn the needle in slowly until the set loses speed. Then turn the needle out to the point of smooth operation. With the set still running under no-load, turn the throttle lever stop screw "D" so it just touches the stop lever, then back off one full turn.

To check float level, remove the entire main fuel adjustment assembly from the float bowl (unscrew large nut from float bowl). The correct carburetor float level is 11/64 inch between the free end of the float and the carburetor body (see Figure 1). Adjustment is made by bending the tab on the float. The float tab should just touch fuel inlet valve.

Do not apply excessive pressure to float valve.

AUTOMATIC CHOKE

Gasoline Fuel: Normal choke setting is approximately 1/8 inch from its closed position at 70°F. If temperature change requires choke adjustment, loosen two screws "A" and "B" (Figure 12). Turn the cover assembly counterclockwise for less choking. To increase choke turn clockwise. Tighten both screws to lock cover in place.

Gas Fuel: Late model sets with Weibull carburetor have no choke. For early model sets with Carter carburetors, the normal choke setting is fully closed with engine not running. Turn adjusting screw in for less choking, out for more choking.

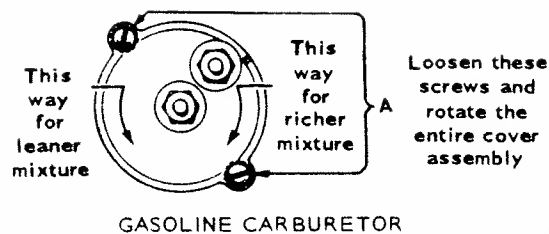


FIGURE 12. CHOKE ADJUSTMENT

TIMING THE IGNITION

Proper ignition timing is important for good engine operation. Refer to the SPECIFICATION section for the correct degree of spark advance before top center (TC) position of piston travel. If available, use a series type test lamp for accuracy.

See that the point gap is properly adjusted. Install the flywheel loosely with its key in place, and turn the flywheel with rotation direction to the position where the mark on the edge of the flywheel is in alignment with the proper degree on the gear cover. The points should just separate at this point. If they do not, remove the flywheel and loosen the magneto backplate mounting screws slightly. If the points separate too soon, shift the entire backplate assembly slightly in a counterclockwise direction. If the points do not separate soon enough, shift the entire backplate assembly clockwise. Tighten the backplate mounting screws and recheck the work for accuracy. When replacing the flywheel, always make sure the key is properly in place on the crankshaft. See Figure 13.

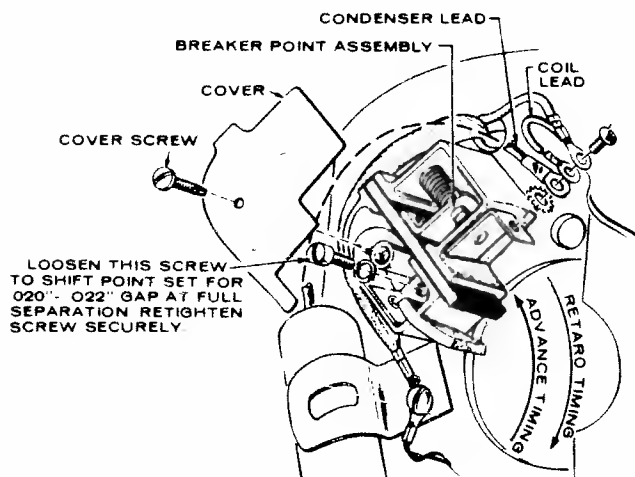
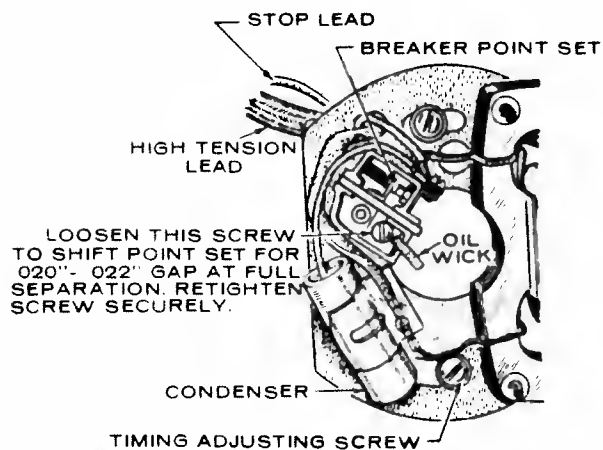


FIGURE 13 BREAKER POINTS

MAINTENANCE

AIR CLEANER

Use the same type and viscosity oil as used for crankcase lubrication.

Oil Bath Type: Remove cup and clean before dirt level reaches shelf in cup. Fill cup with oil to the indicated oil level.

Dry Type: Remove filter element and clean in suitable solvent. Dip element in lubricating oil. Drain excess oil from element and replace on engine.

GOVERNOR LINKAGE

Lubricate the linkage at the carburetor and ball joint ends with powdered graphite (preferably), or a light, sewing machine type oil. Do not lubricate plastic ball joints: they only require cleaning.

CRANKCASE OIL

Oil capacity is 3-1/2 U.S. pints (2-1/2 pints for portables). Fill to the top threads of the oil fill hole. Use a good quality detergent oil with the designation SE, SE/CC (former designation was MS, MS/DG). Oil should be labeled as having passed the MS Sequence Tests (also known as the ASTM G-IV Sequence Tests) and the MIL-L-2104B Tests. Do not use service DS oil at any time. Use the proper SAE number of oil for the expected temperature conditions. Do not mix brands or grades. Extremely dusty or low temperature conditions require oil change at 50 hours.

Above 32°F SAE 30
0°F to 32°F SAE 10W-30, 5W-30
Below 0°F SAE 5W-30

WARNING Do NOT check oil while the generator set is operating. Hot oil could cause burns by blowing out of oil fill tube due to crankcase pressure.

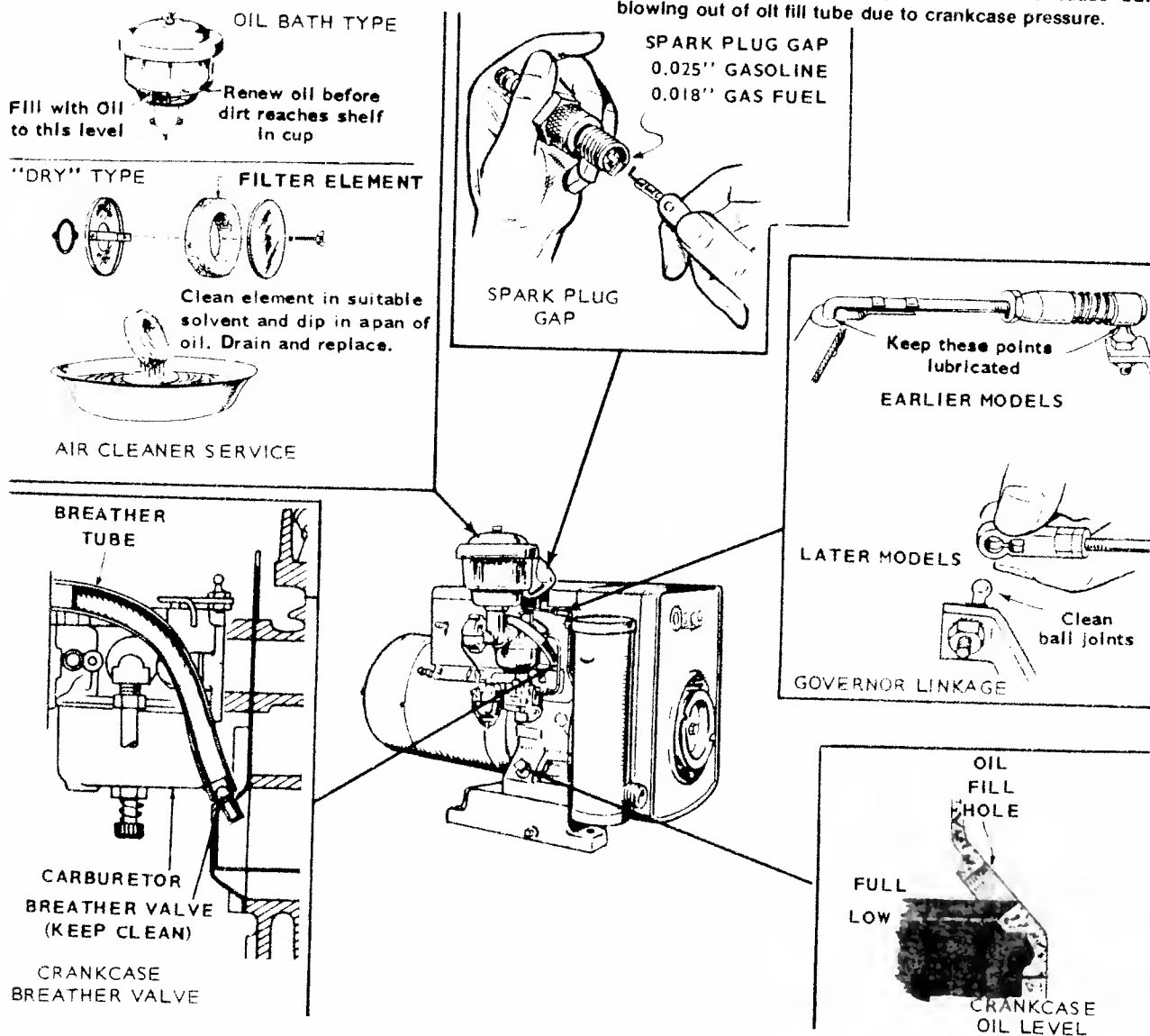


FIGURE 14. PERIODIC MAINTENANCE

GENERATOR

After approximately 500 hours of operation, remove the generator brushes and inspect the wear and scoring. To remove the brushes, unscrew the brush retainers (Figure 15) and pull the brush and spring assembly out of the bell housing. The four smaller retainers hold the slip ring brushes, and the two larger retainers secure the commutator brushes.

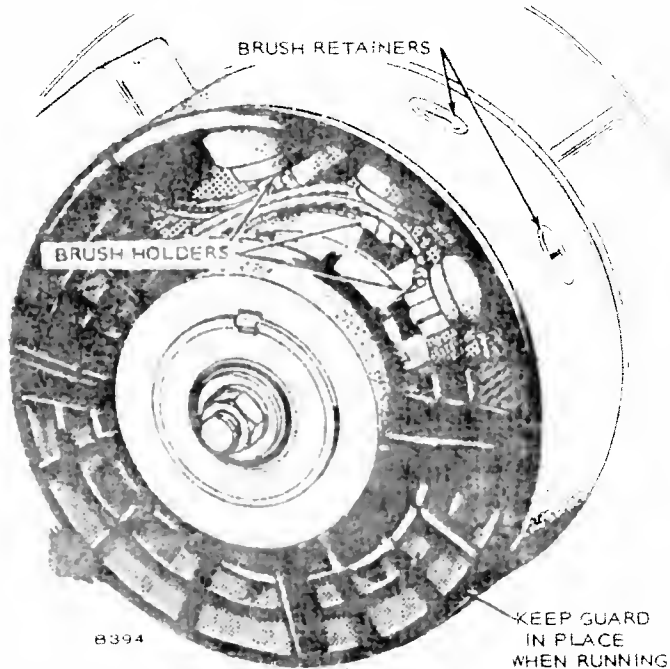


FIGURE 15. BRUSH LOCATION

The brush faces should have a smooth, shiny surface to them, with no deep grooves present. If serious grooves are noted, the commutator and slip rings should be inspected to determine the cause for correction purposes. If slip ring and commutator dressing is required, your nearest Onan Service Center is best equipped to handle the job.

If brushes appear to be in satisfactory condition, and are at least 5/8 inch in length, replace them in the holders from which they were removed. Work the brushes up and down in the holders to be sure there is no sticking or binding. If they bind, clean out the holders with air pressure or a small bristle brush until the brushes slide freely in the holders. Replace the brush retainer screws.

If brushes are worn to less than 5/8 inch length, replace with new brushes (see Figure 16).

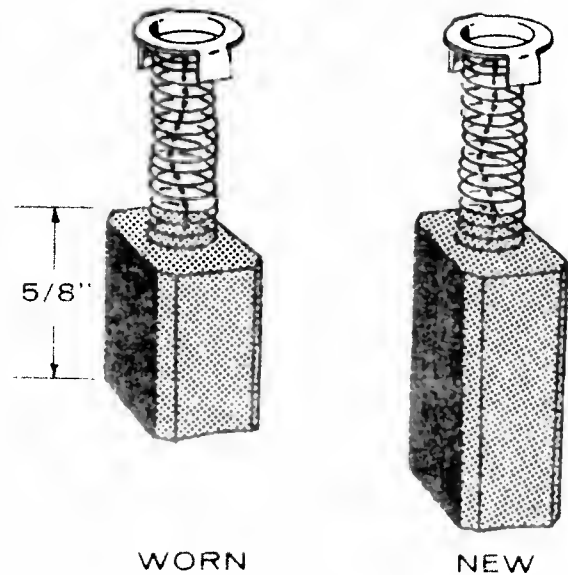


FIGURE 16. BRUSH REPLACEMENT

Every 500 hours, remove the brushes and blow out the dust in the generator by blowing compressed air (not over 35 psi) into all the brush holders with the brushes removed. Service more often if operating in extremely dusty conditions.

Replacement brushes are shaped to fit the curvature of the commutator and seldom need sanding to seat properly. If sparking does occur, run set at light loads until new brushes are properly seated.

CAUTION Never use emery cloth or metal files to seat brushes. Use only brushes of correct part number (see your Onan Service Center). Replace brushes in the same position in holder as they were originally.

PERIODIC SERVICE GUIDE

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check the condition of the crankcase oil, the filters, etc. frequently until the proper service time periods can be established.

For any abnormalities in operation, unusual noises from engine to accessories, loss of power, overheating, etc., contact your nearest dealer.

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS					
	8	50	100	200	400	1000
Inspect Set	x1					
Check Fuel Supply	x					
Check Oil Level	x					
Clean and Check Governor Linkage		x2				
Change Spark Plug			x3			
Change Crankcase Oil			x2			
Replace Air Cleaner Element (Dry Type)			x2			
Check Battery Electrolyte Level (if used)				x		
Inspect Magneto Breaker Points				x4		
Clean Commutator Collector Rings				x		
Clean Fuel Filter					x	
Check Valve Clearance					x4	
Remove Carbon and Lead from Cylinder Head					x4	
Clean Generator with Low Pressure Dry Air					x	
Remove and Clean Oil Base						x4
Grind Valves (If Required)						x4
Clean Carburetor						x4
Check Generator Brushes (Replace if Necessary)	As Required					

x1 - Check for exhaust leaks, fuel leaks, proper mounting, etc.

x2 - Perform more often in extremely dusty conditions.

x3 - Replace at beginning of season or every 100 hours.

x4 - For detailed maintenance, contact your nearest authorized Onan Service Center.

SPECIAL UTILITY SECTION

RATED OUTPUT — UTILITY TRUCK MODELS

Alternating current and direct current are produced at the same time.

Combined AC and DC rated output	1,000 Watts
Maximum DC amperes (automatically limited)	30 Amps
Maximum DC watts (maximum 30 amps x nominal 13 volts)	390 Watts
Available AC output (1000 watts less watts of DC charging current. Minimum (while full load DC connected — truck stopped)	610 Watts
Maximum (while truck running or battery charged and no DC load connected)	1,000 Watts
Open circuit DC voltage (12 volt battery charging)	15 Volts
Nominal AC voltage (power for tools, etc.)	115 Volts

This section applies specifically to the "Utility Truck" models of the AJ series generating sets. These supplementary instructions are to be used, where they apply, instead of the instructions for the standard generating sets.

For instructions not covered in this section, refer to the appropriate section for the standard sets.

The utility set is designed to supply 12 volt DC output for radio, etc., while the truck is stopped at a service job. At the same time, AC power is available for flood lights, power tools, etc. Thus, the generating set eliminates the necessity of running the truck engine to prevent battery run down at a service job. The generating set can also be used to recharge a low truck battery if AC power requirements are sufficiently reduced. In normal operation, the set supplies DC and AC current for the load, but does not recharge the battery.

The utility set has a relay which opens the charging circuit in the generator set when the truck engine is running, to prevent the battery from being charged from both sources at the same time. This is necessary to prevent damage to the reverse current relays in both the truck and generator set charging systems as a result of interaction between them.

CHARGE RATE

Rated DC output is 30 amperes. A circuit breaker opens the charge circuit to protect the generator if DC output is high. Equal time is consumed by the breaker to cut-in and cut-out and it may go through this cycle several times, each succeeding cycle becoming more rapid, until it acts and sounds like a buzzer, during an over-load on the DC output. Generally, the battery will warm up and the charge rate will drop so that the breaker will not reach the buzzing stage.

As the battery reaches a charge condition, its terminal voltage approaches that of the generating set, resulting in a desirable tapering off charge rate. After the battery becomes fully charged, the charge rate equals the DC load (radio, lights, etc.) connected.

The set's charge ammeter reads zero while the truck engine is running.

AC OVER-LOADING

It is not expected that men on the job will determine available load each time before plugging in tools, etc. Overloading is apt to occur especially during night work when both lights and tools are used. If the set speed drops, AC lights will dim, and part of the load must be disconnected. If more AC power is required, simply run the truck's motor to take over the DC load for that interval, and make the full rating available in AC output.

A short circuit across the AC terminals will collapse the field to protect the generator.

GOVERNOR ADJUSTMENT

To check or correct the engine speed, a DC voltmeter is required. The set must be warm and all load disconnected. Proceed as follows:

1. Run plate with full AC load connected for at least 1/2 hour to reach operating temperature.
2. With the load alternately removed and connected, adjust the governor sensitivity screw, if necessary, to attain a minimum drop in speed from no-load to full-load operation with no hunting condition.
3. Remove the AC load and stop the set, then disconnect the generator lead A1 at the relay in the set control.
4. Connect the DC voltmeter across lead A1 and ground.
5. Run the set and adjust the speed to deliver 15 volts DC.
6. Remove the voltmeter, reconnect the A1 lead to the relay and replace other parts removed.

ENGINE TROUBLESHOOTING

TROUBLE															GASOLINE ENGINE TROUBLESHOOTING GUIDE									
															CAUSE									
Backfire at Carburetor	Beating & Wear	Black Exhaust	Blue Exhaust	Burned Exhaust	Connecting Rods	Crankshaft Rod Wear	Cylinder Sticking	Engine Stops	Failure to Start	Governor Hunting	High Oil Pressure	Low Oil Pressure	Loss of Coolant (Water Cooled)	Mechanical Knock	Overheating (Air Cooled)	Piston Wear	Ring Compression	Ring Wear	Sticking Valves					
																				STARTING SYSTEM				
																				Loose or Corroded Battery Connection				
																				Low or Discharged Battery				
																				Faulty Starter				
																				Faulty Start Solenoid				
																				IGNITION SYSTEM				
																				Ignition Timing Wrong				
																				Wrong Spark Plug Gap				
																				Worn Points or Improper Gap Setting				
																				Bad Ignition Coil or Condenser				
																				Faulty Spark Plug Wires				
																				FUEL SYSTEM				
																				Out of Fuel - Cutoff				
																				Lean Fuel Mixture - Readjust				
																				Rich Fuel Mixture or Choke Stuck				
																				Engine Flooded				
																				Poor Quality Fuel				
																				Dirty Carburetor				
																				Dirty Air Cleaner				
																				Dirty Fuel Filter				
																				Defective Fuel Pump				
																				INTERNAL ENGINE				
																				Wrong Valve Clearance				
																				Broken Valve Spring				
																				Valve or Valve Seal Leaking				
																				Piston Rings Worn or Broken				
																				Wrong Bearing Clearance				
																				COOLING SYSTEM (AIR COOLED)				
																				Poor Air Circulation				
																				Dirty or Oily Cooling Fans				
																				Broken Head Gasket				
																				COOLING SYSTEM (WATER COOLED)				
																				Insufficient Coolant				
																				Faulty Thermostat				
																				Worn Water Pump or Pump Seal				
																				Water Passages Restricted				
																				Defective Gaskets				
																				Blown Head Gasket				
																				LUBRICATION SYSTEM				
																				Defective Oil Gauge				
																				Relief Valve Stuck				
																				Faulty Oil Pump				
																				Dirty Oil or Filter				
																				Oil Too Light or Diluted				
																				Oil Level Low				
																				Oil Too Heavy				
																				Dirty Crankcase Breather Valve				
																				THROTTLE AND GOVERNOR				
																				Linkage Out of Adjustment				
																				Linkage Worn or Disconnected				
																				Governor Spring Sensitivity Too Great				
																				Linkage Binding				

PARTS INFORMATION

For additional information on parts or service, contact your nearest authorized Onan dealer or service center. A complete parts manual is available and may be ordered under #924-0221.

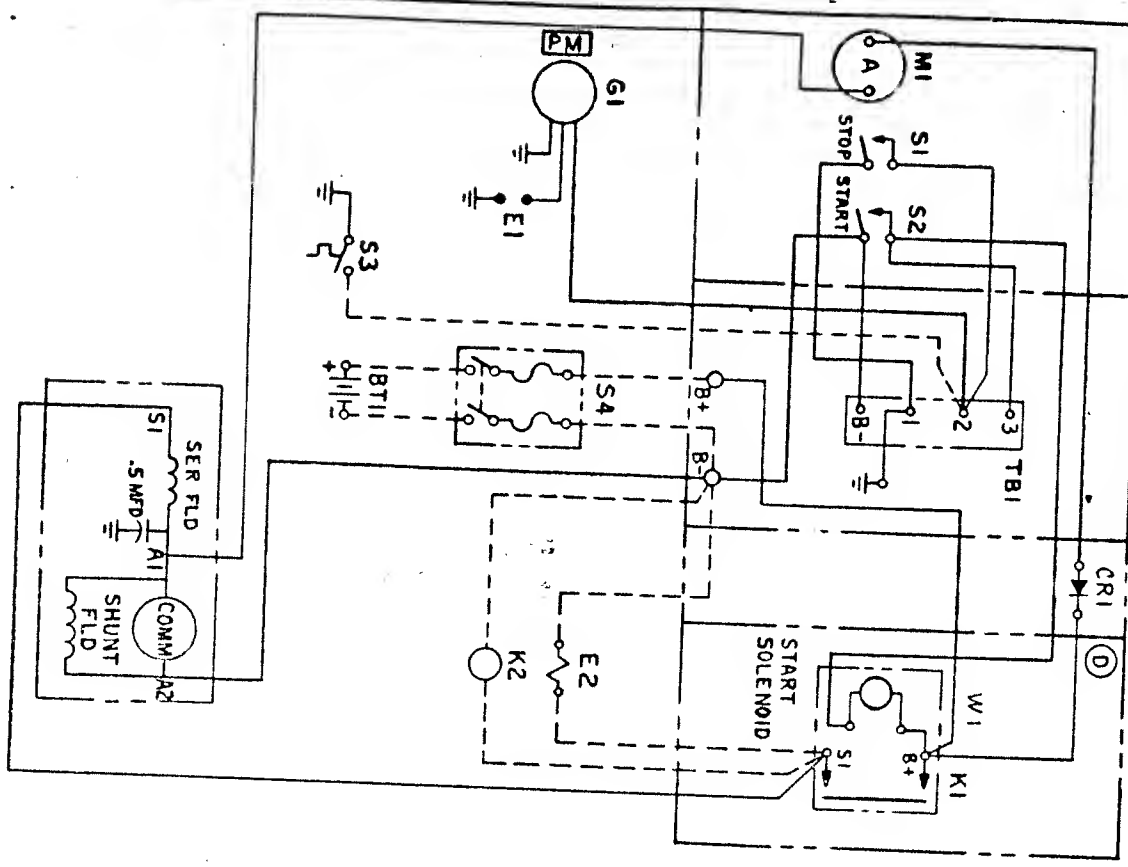
The following Running Replacement Parts List consists of external items which may require replacement due to normal wear and service and can usually be installed by the operator.

RUNNING REPLACEMENT PARTS LIST

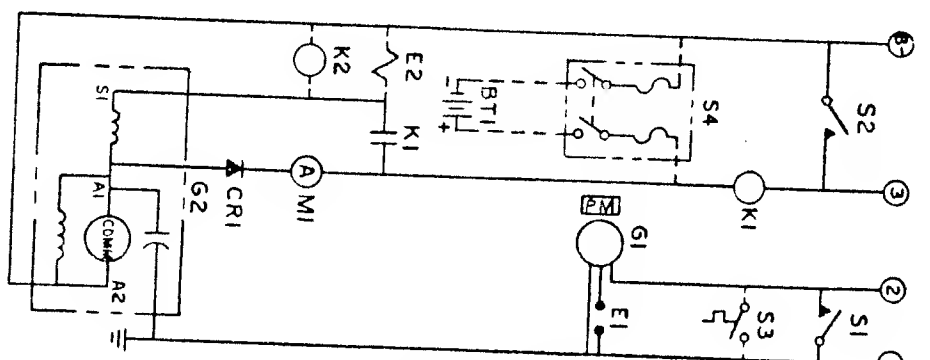
PART NO.	DESCRIPTION
140-0369	Air Cleaner Element (Dry Type)
167-0237	Spark Plug
160-0540	Ignition Breaker Points
312-0033	Condenser (Breaker Points)
160-0155	Magneto Coil
146-0092	Gasoline Carburetor (Manual Choke)
146-0093	Gasoline Carburetor (Electric Choke)
146-0123	Carburetor Repair Kit
123-0486	Breather Valve
214-0041 (DC)	Generator Brushes (4 Pole)
214-0070 (DC)	Generator Brushes (2 Pole)
214-0059 (AC)	Generator Brushes (4 Pole)
214-0072 (AC)	Generator Brushes (2 Pole)
160-0478	Anti-Flicker Points
149-0693	Fuel Pump (Gasoline Only)
402-0045	Mounting Cushion (Generator End)
402-0144	Mounting Cushion (Engine End)
149-0202	Fuel Filter Screen
149-0149	Fuel Filter Gasket
149-0150	Fuel Filter Bowl

WIRING DIAGRAM

INSIDE VIEW OF BOX



SCHEMATIC



610-0336

* FURNISHED BY CUSTOMER
** WHEN USED

REF	DES	PART NO.	QTY	PARTS LIST	DESCRIPTION
B1	BT1	358850	1	BATTERY 32V	BATTERY 32V
C1	CRI	508A109	1	DIODE & HEAT SINK ASSY	DIODE & HEAT SINK ASSY
E1	E1		1	GROMMET	GROMMET
E2	E2		1	SPARK PLUG	SPARK PLUG
G1	G1		1	CHOKE-ELECTRIC	CHOKE-ELECTRIC
G2	G2		1	MAGNETO	MAGNETO
K1	K1	307861	1	SOLENOID - GAS	SOLENOID - GAS
M1	M1	302A62	1	RELAY-START SOLENOID	RELAY-START SOLENOID
S1	S1	308-155	1	AMMETER-CHARGE 45-0-45	AMMETER-CHARGE 45-0-45
S2	S2	308-155	1	SWITCH-STOP (REF)	SWITCH-STOP (REF)
S3	S3	308-155	1	SWITCH-START (REF)	SWITCH-START (REF)
S4	S4	332A222	1	SWITCH-HIGH TEMP CUTOFF	SWITCH-HIGH TEMP CUTOFF
TB1	TB1	332A158	1	SWITCH-FUSED 50 AMP	SWITCH-FUSED 50 AMP
W1	W1	30102408	1	BLOCK-TERMINAL (REF)	BLOCK-TERMINAL (REF)
		30101858	1	BRACKET-TERM BLOCK MTG (REF)	BRACKET-TERM BLOCK MTG (REF)
		336-0291A	1	STUD (1/4-13/4-20NC)	STUD (1/4-13/4-20NC)
		337-0089	1	COVER-CONTROL BOX	COVER-CONTROL BOX
			1	CONSOLE BOX	CONSOLE BOX
			1	LEAD ASSY (B+ TO SOL.)	LEAD ASSY (B+ TO SOL.)
			1	STRAP - BOND	STRAP - BOND

(A)	-01	1.5MAJ-232E/IN
(B)	32 V REMOTE	1.5AJ-232E/1L
		1.5AJ-232E/13L

REV	DESCRIPTION	DATE
H	ADDED 337-0089	11-5-20-76
G	336-0291 ADDED	11-23-74
F	308-0550 ADDED	9-25-73
E	ADDED 332A125	8-31-73
D	CHANGED CRI TIE POINTS	11-12-71
C	CRI WAS 358842	11-12-71
B	WAS 24V REMOTE	9-24-71
A	WAS 1.5AJ-232E/1K & 1/3K	6-17-71

Original DIVISION OF STUDENTS CORPORATION

5-18-71 CDR R. E. T. CONTROL - GEN SET (WIRING DIAGRAM)

SERIAL FROM 610B333 610-0336 B

610-019

JAN 20 1978

PRODUCT: 08080

MODEL	1.5	AI-232E/100	PH	32-40	DC	QTY
WIRE	2	CYCLE	PPH	2600-2900	PF	32
WIRE	2	WAVE	KV	1.5	AMPS	DC Rating
WIRE	2	WAVE	KV	1.5	AMPS	400-5000

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Rating
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37-40 DC

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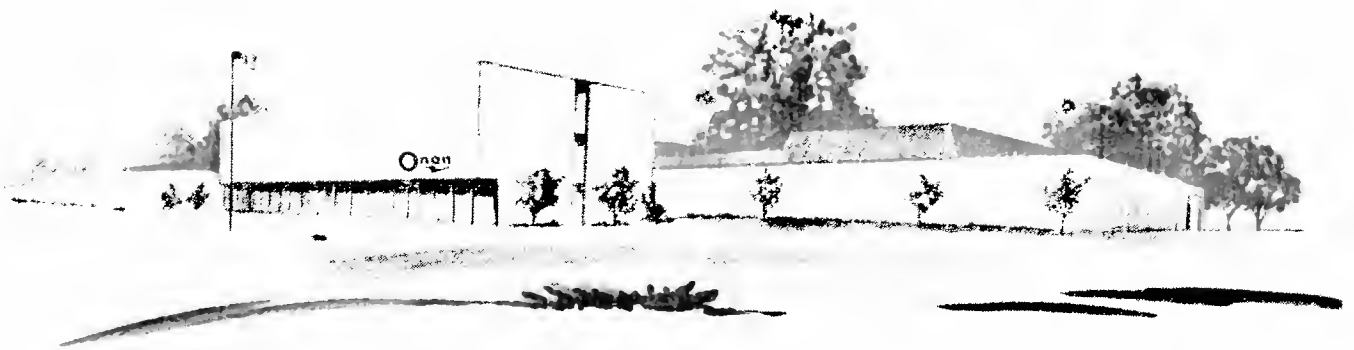
Wiederholungs - C.J.

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